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(54) **Toy vehicle steering arrangement**

(57) A steering mechanism for use in a toy vehicle includes a housing 5 pivotally mounted at 6 and carrying a pair of assemblies each including a movable substantially U-shaped soft magnetic member 1 and a coil 2. The supporting housing also carries rotatably two separate wheel axles 4 of magnetic material. When a coil 2 is energized, its soft magnetic member 1 is magnetically attracted into contact with the associated axle 4 to brake the latter. Simultaneously, the supporting housing itself is rotated around the axis of the shaft 6 to steer the automobile to the desired direction.

FIG. 1

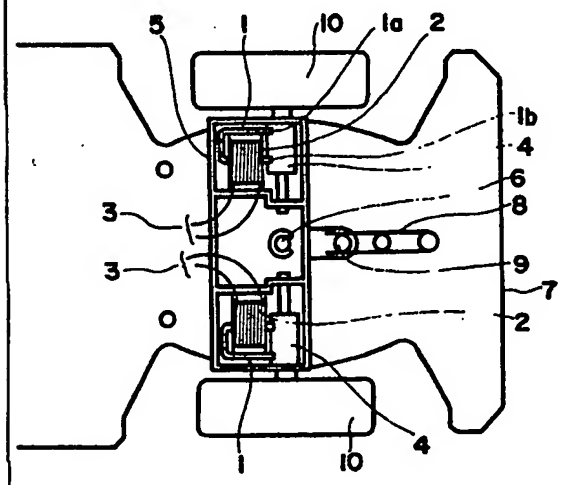

FIG. 2

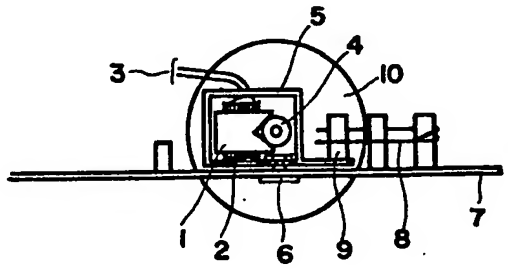

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FIG. 1

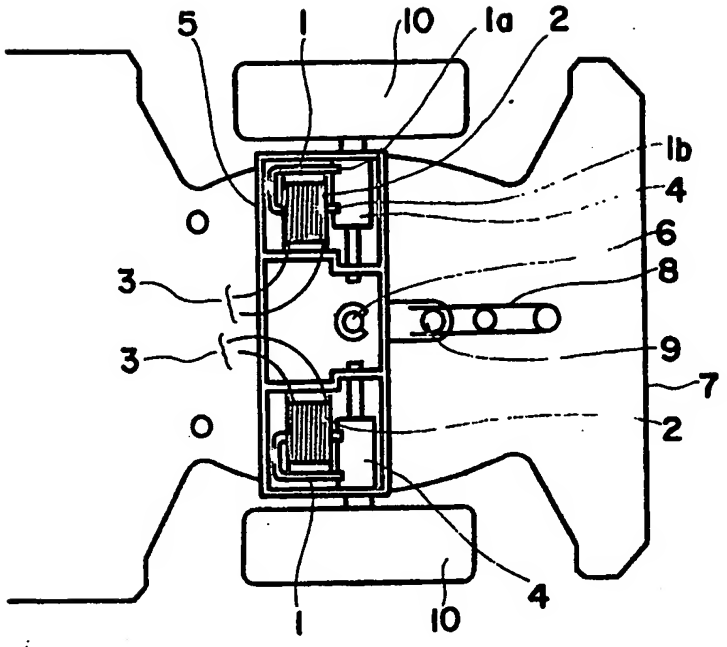
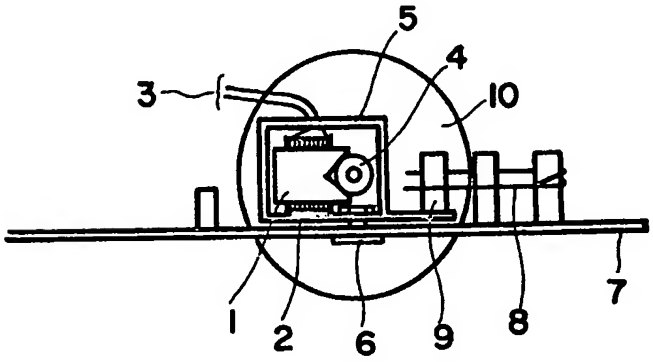


FIG. 2



SPECIFICATION

Steering mechanism f r running toy

Background of the Invention:

The present invention relates to a steering mechanism suitable for use in a running toy such as radio-controlled automobile toy. More specifically, the present invention is concerned with a steering mechanism for the uses mentioned above, having a solenoid coil adapted to produce, when energized, an electromotive force in a soft magnetic material which attracts a tire shaft to steer the automobile toy.

Various toys have been proposed and used for amusing children from old days. Among these toys, the running toys having wheels, such as automobile toys, are most popular because such running toys directly appeal to the instinctive interest of human being in mobile object. Thus, the running toys excel other kinds of toys in both aspects of quantity of products and variety.

As a result of current development of technology, as well as diversification of the user's interests and demands for higher level of technology, the constructions of toys are becoming more delicate, qualified and complicated. This general tendency applies also to the case of the automobile toys. A typical example of such tendency is the adoption of electronic engineering represented by remote steering control by way of radio.

On the other hand, the complication of the construction inevitably leads to an increased possibility or chance of troubles such as breakdown of parts or failure in operative portion of the toy. Particularly, in the steering system of the automobile toys, the construction is so complicated that the assembling work is complicated and difficult to require a delicate adjustment in the assembling process, resulting in a raised cost of production. In addition, the conventional steering system becomes completely unusable when wetted by water. In fact, the troubles concerning the steering mechanism occupies an increasing portion of the causes of sending back of goods from the dealers or toy shops.

In the conventional radio-controlled steering system incorporating a motor or a magnet, the motor or the magnet consumes a considerably large current, while the steering manipulation has to be made with electric current as small as possible. Since it is not allowed to effect at the steering manipulation section the amplification of the electric current to such a level as required by the motor or the magnet, the amplification has t be achieved by the mechanism itself. This requires a too delicate and minut constructi n f the mechanism due to the ad ption of a reducti n gear and so forth, resulting in an impractically increased numb r of parts to cause not only a rise in the material cost but also in an uneconomical increase in th labour cost. Such a delicat m chanism, in addition, is liabl t b come inoperative even by jamming of dusts or other f r ign matters in the gear train.

Summary of the Invention:

Accordingly, an object of the invention is to provide an improved steering mechanism suitable for use in automobile toys, capable of overcoming the above described problems of the prior art.

To this end, according to the invention, there is provided a steering mechanism comprising a supporting housing rotatable to the left and right around the axis of a shaft 6, a pair of soft magnetic members movably disposed in the supporting housing, each soft magnetic member having a substantially U-shaped or similar form and provided at its suitable portion with a coil, and a tire shaft made of a magnetic material and consisting of two parts which are rotatably mounted in the supporting housing at such positions that they can magnetically attract two ends of the soft magnetic members.

The above and other objects, as well as advantageous features of the invention will become more clear from the following description of the preferred embodiment taken in conjunction with the accompanying drawings.

Brief Description of the Drawings:

Figure 1 is a plan view of a steering mechanism constructed in accordance with an embodiment of the invention, applied to front wheels of an automobile toy; and

Figure 2 is a front elevational view of the steering mechanism shown in Fig. 1.

Description of the Preferred Embodiments:

Figs. 1 and 2 are a plan view and a front elevational view of a steering system embodying the present invention, applied to the steering of front wheels of an automobile toy. It is to be noted, however, the steering mechanism of the invention can equally be applied to wheels other than the front wheels.

Referring to these Figures, reference numeral 1,1 denotes a pair of soft magnetic members each having a substantially U-shaped or a similar form and movably mounted in a later-mentioned supporting housing 5, while a reference numeral 2 denotes a coil which is formed by winding a coated electric wire such as enamel-coated wire around a suitable portion of the soft magnetic member 1. These coils 2 are connected to a p wer supply by way of lead lines 3. In th steering mechanism of th invention, there ar used tw units of assembly of the soft magnetic member 1 and the coil 2, on f which is used for turning the aut mobile toy to the left while th other is for turning t the right. The aforementioned supporting housing 5 has a projection 9. This supporting

housing 5 is secured to a chassis portion 7 of the automobil t y in such a manner as to be able to rotate to the left and right around the axis of a shaft 6 t permit the steering motion, and rotatably carries two separate portions of a tire shaft 4 made of a magnetic material. The pair of soft magnetic members 1,1 are movably mounted in the supporting housing 5 in such a manner that two ends 1a, 1b of either one of the soft magnetic members 1,1 are simultaneously attracted by the tire shaft 4. As the coil on either one of the soft magnetic member is energized, the soft magnetic member is moved and attracted by the associated tire shaft to brake the latter. It is preferred that the tire shaft 4 has a large diameter because, by so doing, it is possible to effect the steering with smaller magnetic force, i.e. with smaller electric current.

A reference numeral 8 designates a substantially U-shaped torsion spring fixed to the chassis portion 7 of the automobile toy, in such a manner that the aforementioned projection 9 is sandwiched between the opposing ends of the torsion spring 8. The arrangement is such that the automobile toy can run straight when neither of the coils is energized. Reference numeral 10 denotes tires.

The steering mechanism of the invention having the construction described heretofore operates in a manner explained hereinunder.

As stated above, when neither of the two coils is energized, the torsion spring 8 acts to maintain the running direction straight. Suppose here that one of the two coils, e.g. the left coil as viewed in the direction of running of the toy, is energized, a magnetic force is produced in the associated soft magnetic member 1 so that it is attracted and moved toward the left portion of the tire shaft 4 to bring its ends 1a, 1b into simultaneous contact with the latter. In consequence, the left tire is lightly brakes and, at the same time, the supporting housing 5 as a whole is rotated counter-clockwise to turn the automobile toy to the left. Similarly, the the right turn of the automobile toy is achieved by energization of the right coil.

In the described embodiment, the ends of the soft magnetic member 1 for magnetically contacting the tire shaft 4 have recessed surfaces having both straight walls as will be clearly seen from Fig. 2. This, however, is not exclusive and the ends of the soft magnetic member may have a curvilinearly concaved end surfaces or flat surfaces. It is also possible to arrange such that the tire shaft 4 is inserted into a bore formed in the soft magnetic member 1 with a suitable distance from the latt r. In the radio-controll d aut mobile toy, the manipulation is made from a control box remote from the toy.

As has been described, according t the invention, the soft magnetic m mber 1 has a U-shaped form having two ends 1a, 1b adapted t be simultaneously attracted and contacted by the associated tire shaft 4. This arrangement offers a great advantage of much reduced electric power consumption and increased attracting force, as compared with an arrang ment in which nly ne of the N and S poles is attracted. Consequ ntly, the driving current which is in the conventional mechanism as large as 80 mA at the smallest is reduced advantageously down to 40 mA or smaller. In fact, the inventors have confirmed that the desired steering effect is obtainable even with a small driving current of 18 to 25 mA.

This advantage in turn eliminates the complication of the mechanism necessary for the amplification of the current and saves the labour in the assembling work accordingly, so that the production cost is reduced remarkably partly because of reduction of the labour cost and partly because of the material cost reduced due to the reduction in number of the parts.

The steering mechanism of the invention has a much simplified construction with reduced number of parts due to the elimination of the reduction gear and other parts necessary in the conventional steering mechanism. In consequence, the chance of occurrence of troubles due to jamming of foreign matters and wetting is reduced almost to zero, to ensure a higher quality of the product. In addition, the steering mechanism of the invention having simplified construction suits for mass-production and can suitably be mounted on automobile toys or the like having similar steering demands.

Furthermore, since the steering mechanism of the invention can operate with much reduced electric current of the order ot 40 mA, the life of the battery as the power supply is economically prolonged while avoiding operation failure during the playing attributable to exhaustion of the battery, so that the player can amuse himself without the fear of exhaustion of the power.

Although the invention has been described through specific terms, the embodiment heretofore explained is only for illustrating purpose, and various changes and modifications may be imparted thereto without departing from the spirit or scope of the invention which is limited solely by the appended claim.

What is disclosed herein comprises

A steering mechanism comprising: a supporting housing 5 rotatable to the left and right around the axis of a shaft 6; a pair of soft magnetic members 1,1 m vably disposed in said supp rting, each soft magnetic m mber having a substantially U-shaped or similar form and provided at its suitable p rtion with a coil 2; and a tire shaft made of a magnetic material and consisting of two separate parts which are rotatably mount d in said supporting housing such that each of said separate

parts of said tire shaft can attract simultaneously b th ends 1a, 1b of the associated soft magnetic member 1.

CLAIMS

1. A steering mechanism comprising a supporting housing rotatably mounted on a base for rotation to the left and right about a normal position, a pair of magnetic members movably disposed in the supporting housing, each magnetic member having a substantially U-shaped or similar form and being provided at a suitable portion with a coil, and a wheel shaft made of a magnetic material and consisting of two parts which are rotatably mounted in the supporting housing at such positions that each shaft part can magnetically attract an associated one of said magnetic members to produce deceleration of said shaft part.

2. A steering mechanism as claimed in Claim 1 in which each shaft part can magnetically attract two ends of an associated one of said magnetic members.

3. A steering mechanism as claimed in Claim 2, in which the ends of the magnetic members have V-shaped recesses therein to contact the associated shaft parts.

4. A steering mechanism as claimed in Claim 2, in which the ends of the magnetic members have concave recesses therein to contact the associated shaft parts.

5. A steering mechanism as claimed in Claim 2, in which the ends of the magnetic members have flat portions thereon to contact the associated shaft parts.

6. A steering mechanism as claimed in Claim 1 in which each shaft part extends into a bore in its associated magnetic member, and is spaced from the bore surface when the associated coil is not energised.

7. A steering mechanism as claimed in any preceding Claim including locating means to locate the supporting housing in said normal position.

8. A steering mechanism as claimed in Claim 7 in which said locating means is a spring means.

9. A steering mechanism as claimed in Claim 8 in which said spring means is a substantially U-shaped torsion spring mounted on the base and having two arms which sandwich therebetween a projection on the supporting housing.

10. A steering mechanism as claimed in any preceding Claim in which each magnetic m mb r has its respectiv coil wound round one f its tw arms.

11. A steering m chanism as claimed in any pr ceding Claim in which the base is a chassis portion of a toy vehicle.

12. A steering m chanism substantially as herein described and shown in the accompanying drawing.

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